

SEQUENCE LISTING

<110> Degussa AG

<120> Expression of nitrile hydratases in a two-vector expression system

<130> 040065 AM

<160> 34

<170> PatentIn version 3.1

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<212> DNA

<213> Rhodococcus erythropolis

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<p>gca gtc gaa gac acc ccg acc ctc aag aac gtg atc gtg tgc tcg ctg Ala Val Glu Asp Thr Pro Thr Leu Lys Asn Val Ile Val Cys Ser Leu 100 105 110</p>	336
<p>tgt tca tgc acc gcg tgg ccc att ctc ggc ctg ccc cct acc tgg tac Cys Ser Cys Thr Ala Trp Pro Ile Leu Gly Leu Pro Pro Thr Trp Tyr 115 120 125</p>	384
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 Tyr Asp Thr Thr Ala Glu Thr Arg Tyr Met Val Leu Pro Gln Arg Pro
 165 170 175

gca ggc acc gaa ggc tgg agc cag gaa cag ctt cag gag atc gtc acc 576
 Ala Gly Thr Glu Gly Trp Ser Gln Glu Gln Leu Gln Glu Ile Val Thr
 180 185 190

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Lys Gly Leu Val Pro Asp Gly Tyr Val Glu Gly Trp Lys Lys Thr Phe
 35 40 45

Glu Glu Asp Phe Ser Pro Arg Arg Gly Ala Glu Leu Val Ala Arg Ala
 50 55 60

Trp Thr Asp Pro Asp Phe Arg Gln Leu Leu Leu Thr Asp Gly Thr Ala
 65 70 75 80

Ala Val Ala Gln Tyr Gly Tyr Leu Gly Pro Gln Gly Glu Tyr Ile Val
 85 90 95

Ala Val Glu Asp Thr Pro Thr Leu Lys Asn Val Ile Val Cys Ser Leu
 100 105 110

Cys Ser Cys Thr Ala Trp Pro Ile Leu Gly Leu Pro Pro Thr Trp Tyr
 115 120 125

Lys Ser Phe Glu Tyr Arg Ala Arg Val Val Arg Glu Pro Arg Lys Val
 130 135 140

Leu Phe Glu Met Gly Thr Glu Ile Ala Ser Asp Val Glu Ile Arg Val
145 150 155 160

Tyr Asp Thr Thr Ala Glu Thr Arg Tyr Met Val Leu Pro Gln Arg Pro
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Pro His Thr Val Asn Ala Asp Ile Gly Pro Thr Phe His Ala Glu Trp
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gaa cac ctg ccg tac agc ctg atg ttc gcc ggt gtc gcc gaa ctc ggg 144
Glu His Leu Pro Tyr Ser Leu Met Phe Ala Gly Val Ala Glu Leu Gly
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Ala Phe Ser Val Asp Glu Val Arg Tyr Val Val Glu Arg Met Glu Pro
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cgc cac tac atg atg acc ccg tac tac gag agg tac gtc atc ggc gtc 240
Arg His Tyr Met Met Thr Pro Tyr Tyr Glu Arg Tyr Val Ile Gly Val
65 70 75 80
gcg aca ctg atg gtc gaa aag gga atc ctg acg cag gaa gaa ctc gaa 288
Ala Thr Leu Met Val Glu Lys Gly Ile Leu Thr Gln Glu Glu Leu Glu
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agc ctt gca ggg gga ccg ttc cca ctg tcg ccg ccc agc gaa tcc gaa 336
Ser Leu Ala Gly Gly Pro Phe Pro Leu Ser Arg Pro Ser Glu Ser Glu
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Gly Arg Pro Ala Pro Val Glu Thr Thr Thr Phe Glu Ile Gly Gln Arg

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Tyr	Cys	Arg	Gly	Arg	Val	Gly	Thr	Ile	Ser	His	Arg	Thr	Thr	Glu	Lys			
	145				150					155					160			
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gaa	ccg	acg	tac	cac	gtg	aag	ttc	gac	gcc	gag	gaa	ttg	ttc	ggt	agc	576		
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gac	acc	gac	ggc	ggc	agc	gtc	gta	gtc	gac	ctt	ttc	gag	ggt	tac	ctc	624		
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			20					25					30		
Glu	His	Leu	Pro	Tyr	Ser	Leu	Met	Phe	Ala	Gly	Val	Ala	Glu	Leu	Gly
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Arg	His	Tyr	Met	Met	Thr	Pro	Tyr	Tyr	Glu	Arg	Tyr	Val	Ile	Gly	Val
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Ser	Leu	Ala	Gly	Gly	Pro	Phe	Pro	Leu	Ser	Arg	Pro	Ser	Glu	Ser	Glu

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Tyr Cys Arg Gly Arg Val Gly Thr Ile Ser His Arg Thr Thr Glu Lys 145 150 155 160		
Trp Pro Phe Pro Asp Ala Ile Gly His Gly Arg Asn Asp Ala Gly Glu 165 170 175		
Glu Pro Thr Tyr His Val Lys Phe Asp Ala Glu Glu Leu Phe Gly Ser 180 185 190		
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aag gga ttg gta ccc gac ggt tac gtc gaa gga tgg aag aaa acc ttc Lys Gly Leu Val Pro Asp Gly Tyr Val Glu Gly Trp Lys Lys Thr Phe 35 40 45	144
gag gag gac ttc agt cca agg cgc gga gcg gaa ttg gtc gcg cgg gcg Glu Glu Asp Phe Ser Pro Arg Arg Gly Ala Glu Leu Val Ala Arg Ala 50 55 60	192

tgg acc gac ccc gag ttc cgg cag ttg ctt ctc acc gac ggt acc gcc 240
 Trp Thr Asp Pro Glu Phe Arg Gln Leu Leu Leu Thr Asp Gly Thr Ala
 65 70 75 80
 gcg gtt gcc cag tac gga tac ctg ggc ccc cag ggc gag tac atc gtg 288
 Ala Val Ala Gln Tyr Gly Tyr Leu Gly Pro Gln Gly Glu Tyr Ile Val
 85 90 95
 gca gtc gaa gac acc ccg acc ctc aag aac gtg atc gtg tgc tcg ctg 336
 Ala Val Glu Asp Thr Pro Thr Leu Lys Asn Val Ile Val Cys Ser Leu
 100 105 110
 tgt tca tgc acc gcg tgg ccc att ctc ggc ctg ccc cct acc tgg tac 384
 Cys Ser Cys Thr Ala Trp Pro Ile Leu Gly Leu Pro Pro Thr Trp Tyr
 115 120 125
 aag agt ttc gaa tac cgt gcg cga gtg gtg cgt gag cca cgg aag gtt 432
 Lys Ser Phe Glu Tyr Arg Ala Arg Val Val Arg Glu Pro Arg Lys Val
 130 135 140
 ctc tcc gag atg gga acc gag atc gcg tcg gac gtc gag atc cgc gtc 480
 Leu Ser Glu Met Gly Thr Glu Ile Ala Ser Asp Val Glu Ile Arg Val
 145 150 155 160
 tac gac acc acc gcc gaa act cgc tac atg gtt ctc ccg caa cgt ccc 528
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 gca ggc acc gaa ggc tgg agc cag gaa caa ctg cag gaa atc gtc acc 576
 Ala Gly Thr Glu Gly Trp Ser Gln Glu Gln Leu Gln Glu Ile Val Thr
 180 185 190
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Lys Gly Leu Val Pro Asp Gly Tyr Val Glu Gly Trp Lys Lys Thr Phe
 35 40 45

Glu Glu Asp Phe Ser Pro Arg Arg Gly Ala Glu Leu Val Ala Arg Ala
 50 55 60

Trp Thr Asp Pro Glu Phe Arg Gln Leu Leu Leu Thr Asp Gly Thr Ala
65 70 75 80

Ala Val Ala Gln Tyr Gly Tyr Leu Gly Pro Gln Gly Glu Tyr Ile Val
85 90 95

Ala Val Glu Asp Thr Pro Thr Leu Lys Asn Val Ile Val Cys Ser Leu
100 105 110

Cys Ser Cys Thr Ala Trp Pro Ile Leu Gly Leu Pro Pro Thr Trp Tyr
115 120 125

Lys Ser Phe Glu Tyr Arg Ala Arg Val Val Arg Glu Pro Arg Lys Val
130 135 140

Leu Ser Glu Met Gly Thr Glu Ile Ala Ser Asp Val Glu Ile Arg Val
145 150 155 160

Tyr Asp Thr Thr Ala Glu Thr Arg Tyr Met Val Leu Pro Gln Arg Pro
165 170 175

Ala Gly Thr Glu Gly Trp Ser Gln Glu Gln Leu Gln Glu Ile Val Thr
180 185 190

Lys Asp Cys Leu Ile Gly Val Ala Val Pro Gln Val Pro Thr Val
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Pro His Thr Val Asn Ala Asp Ile Gly Pro Thr Phe His Ala Glu Trp
20 25 30
gaa cac ctg ccg tac agc ctg atg ttc gcc ggt gtc gcc gaa ctc ggg 144
Glu His Leu Pro Tyr Ser Leu Met Phe Ala Gly Val Ala Glu Leu Gly

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cgc cac tac atg atg acc ccg tac tac gag agg tac gtc atc ggc gtc			240
Arg His Tyr Met Met Thr Pro Tyr Tyr Glu Arg Tyr Val Ile Gly Val			
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gcg aca ctg atg gtc gaa aag gga atc ctg acg cag gat gaa ctc gaa			288
Ala Thr Leu Met Val Glu Lys Gly Ile Leu Thr Gln Asp Glu Leu Glu			
	85	90	95
agc ctt gca ggg gga ccg ttc cca ctg tgc cgg ccc agc gaa tcc gaa			336
Ser Leu Ala Gly Gly Pro Phe Pro Leu Ser Arg Pro Ser Glu Ser Glu			
	100	105	110
ggg cgt ccg gca ccc gtc gag acg acc acc ttc gaa atc ggt cag cga			384
Gly Arg Pro Ala Pro Val Glu Thr Thr Thr Phe Glu Ile Gly Gln Arg			
	115	120	125
gta cgc gtg cgc gac gag tac gtt ccg ggg cat att cga atg cct gcg			432
Val Arg Val Arg Asp Glu Tyr Val Pro Gly His Ile Arg Met Pro Ala			
	130	135	140
tac tgc cgc gga cga gtg gga acc atc tct cat cgg act acc gag aag			480
Tyr Cys Arg Gly Arg Val Gly Thr Ile Ser His Arg Thr Thr Glu Lys			
	145	150	155
tgg cca ttt ccc gac gca atc ggc cac ggg cgc aac gac gcc ggc gaa			528
Trp Pro Phe Pro Asp Ala Ile Gly His Gly Arg Asn Asp Ala Gly Glu			
	165	170	175
gaa ccg acg tac cac gtg aag ttc gcc gcc gag gaa ttg ttc ggt agc			576
Glu Pro Thr Tyr His Val Lys Phe Ala Ala Glu Glu Leu Phe Gly Ser			
	180	185	190
gac acc gac ggc ggc agc gtc gta gtc gac ctt ttc gag ggt tac ctc			624
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Arg His Tyr Met Met Thr Pro Tyr Tyr Glu Arg Tyr Val Ile Gly Val		
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Ala Thr Leu Met Val Glu Lys Gly Ile Leu Thr Gln Asp Glu Leu Glu		
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Ser Leu Ala Gly Gly Pro Phe Pro Leu Ser Arg Pro Ser Glu Ser Glu		
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Gly Arg Pro Ala Pro Val Glu Thr Thr Thr Phe Glu Ile Gly Gln Arg		
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Val Arg Val Arg Asp Glu Tyr Val Pro Gly His Ile Arg Met Pro Ala		
130	135	140
Tyr Cys Arg Gly Arg Val Gly Thr Ile Ser His Arg Thr Thr Glu Lys		
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Trp Pro Phe Pro Asp Ala Ile Gly His Gly Arg Asn Asp Ala Gly Glu		
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Glu Pro Thr Tyr His Val Lys Phe Ala Ala Glu Glu Leu Phe Gly Ser		
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Ala Pro Val Ser Asp Arg Ala Trp Ala Leu Phe Arg Ala Leu Asp Gly	
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Lys Gly Leu Val Pro Asp Gly Tyr Val Glu Gly Trp Lys Lys Thr Phe	
35 40 45	
gag gag gac ttc agt cca agg cgc gga gcg gaa ttg gtc gcg cgg gcg	1 92
Glu Glu Asp Phe Ser Pro Arg Arg Gly Ala Glu Leu Val Ala Arg Ala	
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tgg acc gac ccc gag ttc cgg cag ttg ctt ctc acc gac ggt acc gcc	2 40
Trp Thr Asp Pro Glu Phe Arg Gln Leu Leu Leu Thr Asp Gly Thr Ala	
65 70 75 80	
gcg gtt gcc cag tac gga tat ctg ggc ccc cag ggc gag tac atc gtg	2 88
Ala Val Ala Gln Tyr Gly Tyr Leu Gly Pro Gln Gly Glu Tyr Ile Val	
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Ala Val Glu Asp Thr Pro Thr Leu Lys Asn Val Ile Val Cys Ser Leu	
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Cys Ser Cys Thr Ala Trp Pro Ile Leu Gly Leu Pro Pro Thr Trp Tyr	
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Lys Ser Phe Glu Tyr Arg Ala Arg Val Val Arg Glu Pro Arg Lys Val	
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ctc tcc gag atg gga acc gag atc gcg tgc gac gtc gag atc cgc gtc	4 80
Leu Ser Glu Met Gly Thr Glu Ile Ala Ser Asp Val Glu Ile Arg Val	
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Tyr Asp Thr Thr Ala Glu Thr Arg Tyr Met Val Leu Pro Gln Arg Pro	
165 170 175	
gca ggc acc gaa ggc tgg agc cag gaa cag ctt caa gag atc gtc acc	5 76
Ala Gly Thr Glu Gly Trp Ser Gln Glu Gln Leu Gln Glu Ile Val Thr	
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aag gac tgc ctg atc ggc gtc gca gtc ccg cag gtc ccc acc gtc tga	6 24
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Lys Gly Leu Val Pro Asp Gly Tyr Val Glu Gly Trp Lys Lys Thr Phe
 35 40 45

Glu Glu Asp Phe Ser Pro Arg Arg Gly Ala Glu Leu Val Ala Arg Ala
 50 55 60

Trp Thr Asp Pro Glu Phe Arg Gln Leu Leu Leu Thr Asp Gly Thr Ala
 65 70 75 80

Ala Val Ala Gln Tyr Gly Tyr Leu Gly Pro Gln Gly Glu Tyr Ile Val
 85 90 95

Ala Val Glu Asp Thr Pro Thr Leu Lys Asn Val Ile Val Cys Ser Leu
 100 105 110

Cys Ser Cys Thr Ala Trp Pro Ile Leu Gly Leu Pro Pro Thr Trp Tyr
 115 120 125

Lys Ser Phe Glu Tyr Arg Ala Arg Val Val Arg Glu Pro Arg Lys Val
 130 135 140

Leu Ser Glu Met Gly Thr Glu Ile Ala Ser Asp Val Glu Ile Arg Val
 145 150 155 160

Tyr Asp Thr Thr Ala Glu Thr Arg Tyr Met Val Leu Pro Gln Arg Pro
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Ala Gly Thr Glu Gly Trp Ser Gln Glu Gln Leu Gln Glu Ile Val Thr
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Lys Asp Cys Leu Ile Gly Val Ala Val Pro Gln Val Pro Thr Val
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Pro His Thr Val Asn Ala Asp Ile Gly Pro Thr Phe His Ala Glu Trp	
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Glu His Leu Pro Tyr Ser Leu Met Phe Ala Gly Val Ala Glu Leu Gly	
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gca ttc agc gtc gac gaa gtt cga tac gtc gtc gag cgg atg gaa cca	192
Ala Phe Ser Val Asp Glu Val Arg Tyr Val Val Glu Arg Met Glu Pro	
50 55 60	
cgc cac tac atg atg acc ccg tac tac gag agg tac gtc atc ggc gtc	240
Arg His Tyr Met Met Thr Pro Tyr Tyr Glu Arg Tyr Val Ile Gly Val	
65 70 75 80	
gcg aca ctg atg gtc gaa aag gga atc ctg acg cag gaa gaa ctc gaa	288
Ala Thr Leu Met Val Glu Lys Gly Ile Leu Thr Gln Glu Glu Leu Glu	
85 90 95	
agc ctt gca ggg gga ccg ttc cca ctg tcc cgg cca agc gaa tcc gaa	336
Ser Leu Ala Gly Gly Pro Phe Pro Leu Ser Arg Pro Ser Glu Ser Glu	
100 105 110	
ggg cgt ccg gca ccc gtc gag acg acc acc ttc gaa gtc ggt cag cga	384
Gly Arg Pro Ala Pro Val Glu Thr Thr Thr Phe Glu Val Gly Gln Arg	
115 120 125	
gta cgc gtg cgc gac gag tac gtt ccg ggg cat att cga atg cct gcg	432
Val Arg Val Arg Asp Glu Tyr Val Pro Gly His Ile Arg Met Pro Ala	
130 135 140	
tac tgc cgc gga cga gtg gga acc atc tct cat cgg act acc gag aag	480
Tyr Cys Arg Gly Arg Val Gly Thr Ile Ser His Arg Thr Thr Glu Lys	
145 150 155 160	
tgg cca ttt ccc gac gca atc ggc cac ggg cgc aac gac gcc ggc gaa	528
Trp Pro Phe Pro Asp Ala Ile Gly His Gly Arg Asn Asp Ala Gly Glu	
165 170 175	
gaa ccg acg tac cac gtg aag ttc gac gcc gag gaa ttg ttc ggt agc	576
Glu Pro Thr Tyr His Val Lys Phe Asp Ala Glu Glu Leu Phe Gly Ser	
180 185 190	
gac acc gac ggc ggc agc gtc gta gtc gac ctt ttc gag ggt tac ctc	624
Asp Thr Asp Gly Gly Ser Val Val Val Asp Leu Phe Glu Gly Tyr Leu	
195 200 205	

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 Glu Pro Ala Ala
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<210> 12
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Met Asp Gly Val His Asp Leu Ala Gly Val Gln Gly Phe Gly Lys Val
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Glu His Leu Pro Tyr Ser Leu Met Phe Ala Gly Val Ala Glu Leu Gly
 35 40 45

Ala Phe Ser Val Asp Glu Val Arg Tyr Val Val Glu Arg Met Glu Pro
 50 55 60

Arg His Tyr Met Met Thr Pro Tyr Tyr Glu Arg Tyr Val Ile Gly Val
 65 70 75 80

Ala Thr Leu Met Val Glu Lys Gly Ile Leu Thr Gln Glu Glu Leu Glu
 85 90 95

Ser Leu Ala Gly Gly Pro Phe Pro Leu Ser Arg Pro Ser Glu Ser Glu
 100 105 110

Gly Arg Pro Ala Pro Val Glu Thr Thr Thr Phe Glu Val Gly Gln Arg
 115 120 125

Val Arg Val Arg Asp Glu Tyr Val Pro Gly His Ile Arg Met Pro Ala
 130 135 140

Tyr Cys Arg Gly Arg Val Gly Thr Ile Ser His Arg Thr Thr Glu Lys
 145 150 155 160

Trp Pro Phe Pro Asp Ala Ile Gly His Gly Arg Asn Asp Ala Gly Glu
 165 170 175

Glu Pro Thr Tyr His Val Lys Phe Asp Ala Glu Glu Leu Phe Gly Ser
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Asp Thr Asp Gly Gly Ser Val Val Val Asp Leu Phe Glu Gly Tyr Leu
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Glu Pro Ala Ala
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 Ala Ile Glu Thr Leu Leu Tyr Glu Arg Gly Leu Ile Thr Pro Ala Ala
 20 25 30
 gtc gac cga gtc gtt tcg tac tac gag aac gag atc ggc ccg atg ggc 144
 Val Asp Arg Val Val Ser Tyr Tyr Glu Asn Glu Ile Gly Pro Met Gly
 35 40 45
 ggt gcc aag gtc gtg gcg aag tcc tgg gtg gac cct gag tac cgc aag 192
 Gly Ala Lys Val Val Ala Lys Ser Trp Val Asp Pro Glu Tyr Arg Lys
 50 55 60
 tgg ctc gaa gag gac gcg acg gcc gcg atg gcg tca ttg ggc tat gcc 240
 Trp Leu Glu Glu Asp Ala Thr Ala Ala Met Ala Ser Leu Gly Tyr Ala
 65 70 75 80
 ggt gag cag gca cac caa att tcg gcg gtc ttc aac gac tcc caa acg 288
 Gly Glu Gln Ala His Gln Ile Ser Ala Val Phe Asn Asp Ser Gln Thr
 85 90 95
 cat cac gtg gtg gtg tgc act ctg tgt tcg tgc tat ccg tgg ccg gtg 336
 His His Val Val Val Cys Thr Leu Cys Ser Cys Tyr Pro Trp Pro Val
 100 105 110
 ctt ggt ctc ccg ccc gcc tgg tac aag agc atg gag tac ccg tcc cga 384
 Leu Gly Leu Pro Pro Ala Trp Tyr Lys Ser Met Glu Tyr Arg Ser Arg
 115 120 125
 gtg gta gcg gac cct cgt gga gtg ctc aag cgc gat ttc ggt ttc gac 432
 Val Val Ala Asp Pro Arg Gly Val Leu Lys Arg Asp Phe Gly Phe Asp
 130 135 140
 atc ccc gat gag gtg gag gtc agg gtt tgg gac agc agc tcc gaa atc 480
 Ile Pro Asp Glu Val Glu Val Arg Val Trp Asp Ser Ser Ser Glu Ile

15

145	150	155	160	
cgc tac atc gtc atc ccg gaa cgg ccg gcc ggc acc gac ggt tgg tcc				528
Arg Tyr Ile Val Ile Pro Glu Arg Pro Ala Gly Thr Asp Gly Trp Ser	165	170	175	
gag gac gag ctg gcg aag ctg gtg agt cgg gac tcg atg atc ggt gtc				576
Glu Asp Glu Leu Ala Lys Leu Val Ser Arg Asp Ser Met Ile Gly Val	180	185	190	
agt aat gcg ctc aca ccc cag gaa gtg atc gta tga				612
Ser Asn Ala Leu Thr Pro Gln Glu Val Ile Val	195	200		

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 <213> Rhodococcus erythropolis

<400> 14

Val Ser Glu His Val Asn Lys Tyr Thr Glu Tyr Glu Ala Arg Thr Lys	
1 5 10 15	
Ala Ile Glu Thr Leu Leu Tyr Glu Arg Gly Leu Ile Thr Pro Ala Ala	
20 25 30	
Val Asp Arg Val Val Ser Tyr Tyr Glu Asn Glu Ile Gly Pro Met Gly	
35 40 45	
Gly Ala Lys Val Val Ala Lys Ser Trp Val Asp Pro Glu Tyr Arg Lys	
50 55 60	
Trp Leu Glu Glu Asp Ala Thr Ala Ala Met Ala Ser Leu Gly Tyr Ala	
65 70 75 80	
Gly Glu Gln Ala His Gln Ile Ser Ala Val Phe Asn Asp Ser Gln Thr	
85 90 95	
His His Val Val Val Cys Thr Leu Cys Ser Cys Tyr Pro Trp Pro Val	
100 105 110	
Leu Gly Leu Pro Pro Ala Trp Tyr Lys Ser Met Glu Tyr Arg Ser Arg	
115 120 125	
Val Val Ala Asp Pro Arg Gly Val Leu Lys Arg Asp Phe Gly Phe Asp	
130 135 140	
Ile Pro Asp Glu Val Glu Val Arg Val Trp Asp Ser Ser Ser Glu Ile	

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<222> (1) .. (690)  
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Met	Asp	Gly	Ile	His	Asp	Thr	Gly	Gly	Met	Thr	Gly	Tyr	Gly	Pro	Val	
1				5					10					15		
ccc	tat	cag	aag	gac	gag	ccc	ttc	ttc	cac	tac	gag	tgg	gag	ggg	cgg	96
Pro	Tyr	Gln	Lys	Asp	Glu	Pro	Phe	Phe	His	Tyr	Glu	Trp	Glu	Gly	Arg	
			20					25					30			
acc	ctg	tcg	att	ctg	acc	tgg	atg	cat	ctc	aag	ggc	atg	tcg	tgg	tgg	144
Thr	Leu	Ser	Ile	Leu	Thr	Trp	Met	His	Leu	Lys	Gly	Met	Ser	Trp	Trp	
		35					40					45				
gac	aag	tcg	cgg	ttc	ttc	cgg	gag	tcg	atg	ggg	aac	gaa	aac	tac	gtc	192
Asp	Lys	Ser	Arg	Phe	Phe	Arg	Glu	Ser	Met	Gly	Asn	Glu	Asn	Tyr	Val	
	50					55					60					
aac	gag	att	cgc	aac	tcg	tac	tac	acc	cac	tgg	ctg	agt	gcg	gca	gaa	240
Asn	Glu	Ile	Arg	Asn	Ser	Tyr	Tyr	Thr	His	Trp	Leu	Ser	Ala	Ala	Glu	
65					70					75					80	
cgt	atc	ctc	gtc	gcc	gac	aag	atc	atc	acc	gaa	gaa	gag	cga	aag	cac	288
Arg	Ile	Leu	Val	Ala	Asp	Lys	Ile	Ile	Thr	Glu	Glu	Glu	Arg	Lys	His	
				85					90					95		
cgt	gtg	cag	gag	atc	ctc	gag	ggg	cgg	tac	acg	gac	agg	aac	ccg	tcg	336
Arg	Val	Gln	Glu	Ile	Leu	Glu	Gly	Arg	Tyr	Thr	Asp	Arg	Asn	Pro	Ser	
			100					105					110			
cgg	aag	ttc	gat	ccg	gcc	gag	atc	gag	aag	gcg	atc	gaa	cgg	ctt	cac	384
Arg	Lys	Phe	Asp	Pro	Ala	Glu	Ile	Glu	Lys	Ala	Ile	Glu	Arg	Leu	His	
		115						120				125				

gag ccc cac tcc cta gca ctt cca gga gcg gag ccg agt ttc tcc ctc 432
 Glu Pro His Ser Leu Ala Leu Pro Gly Ala Glu Pro Ser Phe Ser Leu
 130 135 140
 ggt gac aag gtc aaa gtg aag aat atg aac ccg ctg gga cac aca cgg 480
 Gly Asp Lys Val Lys Val Lys Asn Met Asn Pro Leu Gly His Thr Arg
 145 150 155 160
 tgc ccg aaa tat gtg cgg aac aag atc ggg gaa atc gtc acc tcc cac 528
 Cys Pro Lys Tyr Val Arg Asn Lys Ile Gly Glu Ile Val Thr Ser His
 165 170 175
 ggc tgc cag atc tat ccc gag agc agc tcc gcc ggc ctc ggc gac gat 576
 Gly Cys Gln Ile Tyr Pro Glu Ser Ser Ser Ala Gly Leu Gly Asp Asp
 180 185 190
 ccc cgc ccg ctc tac acg gtc gcg ttt tcc gcc cag gaa ctg tgg ggc 624
 Pro Arg Pro Leu Tyr Thr Val Ala Phe Ser Ala Gln Glu Leu Trp Gly
 195 200 205
 gac gac gga aac ggg aaa gac gta gtg tgc gtc gat ctc tgg gaa ccg 672
 Asp Asp Gly Asn Gly Lys Asp Val Val Cys Val Asp Leu Trp Glu Pro
 210 215 220
 tac ctg atc tct gcg tga 690
 Tyr Leu Ile Ser Ala
 225

<210> 16
 <211> 229
 <212> PRT
 <213> Rhodococcus erythropolis
 <400> 16

Met Asp Gly Ile His Asp Thr Gly Gly Met Thr Gly Tyr Gly Pro Val
 1 5 10 15
 Pro Tyr Gln Lys Asp Glu Pro Phe Phe His Tyr Glu Trp Glu Gly Arg
 20 25 30
 Thr Leu Ser Ile Leu Thr Trp Met His Leu Lys Gly Met Ser Trp Trp
 35 40 45
 Asp Lys Ser Arg Phe Phe Arg Glu Ser Met Gly Asn Glu Asn Tyr Val
 50 55 60
 Asn Glu Ile Arg Asn Ser Tyr Tyr Thr His Trp Leu Ser Ala Ala Glu
 65 70 75 80
 Arg Ile Leu Val Ala Asp Lys Ile Ile Thr Glu Glu Glu Arg Lys His
 85 90 95

18

Arg Val Gln Glu Ile Leu Glu Gly Arg Tyr Thr Asp Arg Asn Pro Ser
 100 105 110

Arg Lys Phe Asp Pro Ala Glu Ile Glu Lys Ala Ile Glu Arg Leu His
 115 120 125

Glu Pro His Ser Leu Ala Leu Pro Gly Ala Glu Pro Ser Phe Ser Leu
 130 135 140

Gly Asp Lys Val Lys Val Lys Asn Met Asn Pro Leu Gly His Thr Arg
 145 150 155 160

Cys Pro Lys Tyr Val Arg Asn Lys Ile Gly Glu Ile Val Thr Ser His
 165 170 175

Gly Cys Gln Ile Tyr Pro Glu Ser Ser Ser Ala Gly Leu Gly Asp Asp
 180 185 190

Pro Arg Pro Leu Tyr Thr Val Ala Phe Ser Ala Gln Glu Leu Trp Gly
 195 200 205

Asp Asp Gly Asn Gly Lys Asp Val Val Cys Val Asp Leu Trp Glu Pro
 210 215 220

Tyr Leu Ile Ser Ala
 225

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 <212> DNA
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<220>
 <223> Primer

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 gcccgcataa gaaaaggtga ac

22

<210> 18
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 <212> DNA
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<220>
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<400> 18

gcatgccttc aaatcagcct g 21

<210> 19
<211> 24
<212> DNA
<213> Artificial

<220>
<223> Primer

<400> 19
agggtgaacc atatgtcagt aacg 24

<210> 20
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<212> DNA
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<220>
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<400> 20
tgtcggatcc atcagacggt gg 22

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<220>
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agcaccatat ggatggagta cac 23

<210> 22
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<212> DNA
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<220>
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<400> 22
gttgggaatt caggccgcag g 21

<210> 23
<211> 27
<212> DNA
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<220>
<223> Primer

<400> 23
cgcggatcca agaaggagat atacatg 27

<210> 24
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<212> DNA
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<220>
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<400> 24
ccgcaacggtt caaacggtct gg 22

<210> 25
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<220>
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<400> 25
aggaatacgc atatgagcga gcacgtc 27

<210> 26
<211> 30
<212> DNA
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<220>
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<400> 26
gtgtggatcc actcatacga tcacttcctg 30

<210> 27
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer

<400> 27
aggaatgagc atatggatgg tatccacgac a 31

<210> 28
<211> 33
<212> DNA
<213> Artificial

<220>
<223> Primer

<400> 28
 atcgggatcc tttcacgcag agatcaggta cgg 33

<210> 29
 <211> 35
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 29
 ctcaggatcc aaggagtgat cgtatgagtg aagac 35

<210> 30
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 <212> DNA
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<400> 30
 acaggagctc tcagtcgatg atggcc 26

<210> 31
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gca ccg ccc cgc gac aat ggc gag ctt gta ttc acc gag cct tgg gaa 96
 Ala Pro Pro Arg Asp Asn Gly Glu Leu Val Phe Thr Glu Pro Trp Glu
 20 25 30

gca acg gca ttc ggg gtc gcc atc gcg ctt tcg gat cag aag tcg tac 144
 Ala Thr Ala Phe Gly Val Ala Ile Ala Leu Ser Asp Gln Lys Ser Tyr
 35 40 45

gaa tgg gag ttc ttc cga cag cgt ctc att cac tcc atc gct gag gcc 192
 Glu Trp Glu Phe Phe Arg Gln Arg Leu Ile His Ser Ile Ala Glu Ala
 50 55 60

aac ggt tgc gag gca tac tac gag agc tgg aca aag gcg ctc gag gcc 240
 Asn Gly Cys Glu Ala Tyr Tyr Glu Ser Trp Thr Lys Ala Leu Glu Ala
 65 70 75 80

22

agc gtg gtc gac tcg ggg ctg atc agc gaa gat gag atc cgc gag cgc 288
 Ser Val Val Asp Ser Gly Leu Ile Ser Glu Asp Glu Ile Arg Glu Arg
 85 90 95

atg gaa tcg atg gcc atc atc gac tga 315
 Met Glu Ser Met Ala Ile Ile Asp
 100

<210> 32
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 <212> PRT
 <213> Rhodococcus erythropolis

<400> 32

Met Ser Glu Asp Thr Leu Thr Asp Arg Leu Pro Ala Thr Gly Thr Ala
 1 5 10 15

Ala Pro Pro Arg Asp Asn Gly Glu Leu Val Phe Thr Glu Pro Trp Glu
 20 25 30

Ala Thr Ala Phe Gly Val Ala Ile Ala Leu Ser Asp Gln Lys Ser Tyr
 35 40 45

Glu Trp Glu Phe Phe Arg Gln Arg Leu Ile His Ser Ile Ala Glu Ala
 50 55 60

Asn Gly Cys Glu Ala Tyr Tyr Glu Ser Trp Thr Lys Ala Leu Glu Ala
 65 70 75 80

Ser Val Val Asp Ser Gly Leu Ile Ser Glu Asp Glu Ile Arg Glu Arg
 85 90 95

Met Glu Ser Met Ala Ile Ile Asp
 100

<210> 33
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 <213> Rhodococcus erythropolis

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 <222> (1)..(1200)
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 Met Val Asp Thr Arg Leu Pro Val Thr Val Leu Ser Gly Phe Leu Gly
 1 5 10 15

gcc ggg aag acg aca cta ctc aac gag atc ctg cga aat cga gag ggt Ala Gly Lys Thr Thr Leu Leu Asn Glu Ile Leu Arg Asn Arg Glu Gly 20 25 30	96
cgg cgg gtc gcg gtg atc gtc aac gac atg agc gaa atc aac atc gac Arg Arg Val Ala Val Ile Val Asn Asp Met Ser Glu Ile Asn Ile Asp 35 40 45	144
agt gca gaa gtc gag cgt gag atc tcg ctc agt cgc tcc gag gag aaa Ser Ala Glu Val Glu Arg Glu Ile Ser Leu Ser Arg Ser Glu Glu Lys 50 55 60	192
ctg gtc gag atg acc aac ggc tgc atc tgc tgc act ctg cga gag gat Leu Val Glu Met Thr Asn Asn Gly Cys Ile Cys Cys Thr Leu Arg Glu Asp 65 70 75 80	240
ctt ctt tcc gag atc agc gcc ttg gcc gcc gat ggc cga ttc gac tac Leu Leu Ser Glu Ile Ser Ala Leu Ala Ala Asp Gly Arg Phe Asp Tyr 85 90 95	288
cta ctc atc gaa tct tcg ggc atc tcc gaa ccg ctt ccc gtc gca gag Leu Leu Ile Glu Ser Ser Gly Ile Ser Glu Pro Leu Pro Val Ala Glu 100 105 110	336
acg ttc aca ttc atc gat acc gac ggc cac gcc ctc gcc gac gtc gcc Thr Phe Thr Phe Ile Asp Thr Asp Gly His Ala Leu Ala Asp Val Ala 115 120 125	384
cga ctc gac acc atg gtc acc gtc gtc gac ggc cac agt ttt ctg cgc Arg Leu Asp Thr Met Val Thr Val Val Asp Gly His Ser Phe Leu Arg 130 135 140	432
gac tac acg gct ggg ggc cgc gtc gaa gcc gat gcc ccg gaa gac gaa Asp Tyr Thr Ala Gly Gly Arg Val Glu Ala Asp Ala Pro Glu Asp Glu 145 150 155 160	480
cga gac atc gcg gat ctg ctt gtc gat cag atc gaa ttt gcc gac gtc Arg Asp Ile Ala Asp Leu Leu Val Asp Gln Ile Glu Phe Ala Asp Val 165 170 175	528
atc ctg gtg agc aag gcc gat ctc gtc tcg cac cag cac ctg gtc gaa Ile Leu Val Ser Lys Ala Asp Leu Val Ser His Gln His Leu Val Glu 180 185 190	576
ttg acc gca gtc ctg cgc tct ttg aac gca tcc gct gcg ata gtt ccg Leu Thr Ala Val Leu Arg Ser Leu Asn Ala Ser Ala Ala Ile Val Pro 195 200 205	624
atg acg ctc ggt cgc atc cca ctc gac acg att ctc gac acc ggt ttg Met Thr Leu Gly Arg Ile Pro Leu Asp Thr Ile Leu Asp Thr Gly Leu 210 215 220	672
ttc tcg ctc gaa aag gct gca cag gcc ccc gga tgg tta caa gaa ctc Phe Ser Leu Glu Lys Ala Ala Gln Ala Pro Gly Trp Leu Gln Glu Leu 225 230 235 240	720
caa ggt gaa cac atc ccc gaa acc gaa gag tac gga atc agt tcg gtg Gln Gly Glu His Ile Pro Glu Thr Glu Glu Tyr Gly Ile Ser Ser Val	768

24

245										250					255					
gtg	tac	cgc	gag	cgc	gca	ccc	ttc	cac	ccc	caa	cgg	ctg	cat	gat	ttc	816				
Val	Tyr	Arg	Glu	Arg	Ala	Pro	Phe	His	Pro	Gln	Arg	Leu	His	Asp	Phe					
			260					265					270							
ctc	agc	agc	gag	tgg	acc	aac	gga	aag	tta	ctt	cgg	gcc	aag	ggc	tac	864				
Leu	Ser	Ser	Glu	Trp	Thr	Asn	Gly	Lys	Leu	Leu	Arg	Ala	Lys	Gly	Tyr					
		275					280					285								
tac	tgg	aat	gcc	ggc	cgg	ttc	acc	gag	atc	ggg	agt	att	tct	cag	gcc	912				
Tyr	Trp	Asn	Ala	Gly	Arg	Phe	Thr	Glu	Ile	Gly	Ser	Ile	Ser	Gln	Ala					
	290					295					300									
ggt	cat	ctc	att	cgc	cac	gga	tac	gtc	ggc	cgt	tgg	tgg	aag	ttt	cta	960				
Gly	His	Leu	Ile	Arg	His	Gly	Tyr	Val	Gly	Arg	Trp	Trp	Lys	Phe	Leu					
305					310					315					320					
ccc	cgt	gac	gag	tgg	ccg	gcc	gac	gat	tac	cgt	cgt	gac	gga	atc	ctc	1008				
Pro	Arg	Asp	Glu	Trp	Pro	Ala	Asp	Asp	Tyr	Arg	Arg	Asp	Gly	Ile	Leu					
			325						330					335						
gac	aag	tgg	gaa	gaa	ccc	gtc	gga	gac	tgc	cga	caa	gaa	ctc	gtc	ttc	1056				
Asp	Lys	Trp	Glu	Glu	Pro	Val	Gly	Asp	Cys	Arg	Gln	Glu	Leu	Val	Phe					
			340					345					350							
atc	ggc	caa	gcc	atc	gac	ccg	tct	cga	ctg	cac	cga	gaa	ctc	gac	gcg	1104				
Ile	Gly	Gln	Ala	Ile	Asp	Pro	Ser	Arg	Leu	His	Arg	Glu	Leu	Asp	Ala					
		355					360					365								
tgt	cta	ctc	acc	aca	gcc	gag	atc	gaa	ctc	ggg	cca	gac	gtg	tgg	acc	1152				
Cys	Leu	Leu	Thr	Thr	Ala	Glu	Ile	Glu	Leu	Gly	Pro	Asp	Val	Trp	Thr					
	370					375					380									
acc	tgg	agc	gac	ccc	ctg	ggc	gtc	ggc	tat	acc	gac	cag	acc	gtt	tga	1200				
Thr	Trp	Ser	Asp	Pro	Leu	Gly	Val	Gly	Tyr	Thr	Asp	Gln	Thr	Val						
385					390				395											

<210> 34

<211> 399

<212> PRT

<213> Rhodococcus erythropolis

<400> 34

Met	Val	Asp	Thr	Arg	Leu	Pro	Val	Thr	Val	Leu	Ser	Gly	Phe	Leu	Gly
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Ala	Gly	Lys	Thr	Thr	Leu	Leu	Asn	Glu	Ile	Leu	Arg	Asn	Arg	Glu	Gly
			20					25					30		

Arg	Arg	Val	Ala	Val	Ile	Val	Asn	Asp	Met	Ser	Glu	Ile	Asn	Ile	Asp
		35					40					45			

Ser	Ala	Glu	Val	Glu	Arg	Glu	Ile	Ser	Leu	Ser	Arg	Ser	Glu	Glu	Lys
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

50		55		60
Leu Val Glu Met Thr Asn Gly Cys Ile Cys Cys Thr Leu Arg Glu Asp				
65		70		75
Leu Leu Ser Glu Ile Ser Ala Leu Ala Ala Asp Gly Arg Phe Asp Tyr				
	85		90	95
Leu Leu Ile Glu Ser Ser Gly Ile Ser Glu Pro Leu Pro Val Ala Glu				
	100		105	110
Thr Phe Thr Phe Ile Asp Thr Asp Gly His Ala Leu Ala Asp Val Ala				
	115		120	125
Arg Leu Asp Thr Met Val Thr Val Val Asp Gly His Ser Phe Leu Arg				
	130		135	140
Asp Tyr Thr Ala Gly Gly Arg Val Glu Ala Asp Ala Pro Glu Asp Glu				
145		150		155
Arg Asp Ile Ala Asp Leu Leu Val Asp Gln Ile Glu Phe Ala Asp Val				
	165		170	175
Ile Leu Val Ser Lys Ala Asp Leu Val Ser His Gln His Leu Val Glu				
	180		185	190
Leu Thr Ala Val Leu Arg Ser Leu Asn Ala Ser Ala Ala Ile Val Pro				
	195		200	205
Met Thr Leu Gly Arg Ile Pro Leu Asp Thr Ile Leu Asp Thr Gly Leu				
	210		215	220
Phe Ser Leu Glu Lys Ala Ala Gln Ala Pro Gly Trp Leu Gln Glu Leu				
225		230		235
Gln Gly Glu His Ile Pro Glu Thr Glu Glu Tyr Gly Ile Ser Ser Val				
	245		250	255
Val Tyr Arg Glu Arg Ala Pro Phe His Pro Gln Arg Leu His Asp Phe				
	260		265	270
Leu Ser Ser Glu Trp Thr Asn Gly Lys Leu Leu Arg Ala Lys Gly Tyr				
	275		280	285

Tyr Trp Asn Ala Gly Arg Phe Thr Glu Ile Gly Ser Ile Ser Gln Ala
290 295 300

Gly His Leu Ile Arg His Gly Tyr Val Gly Arg Trp Trp Lys Phe Leu
305 310 315 320

Pro Arg Asp Glu Trp Pro Ala Asp Asp Tyr Arg Arg Asp Gly Ile Leu
325 330 335

Asp Lys Trp Glu Glu Pro Val Gly Asp Cys Arg Gln Glu Leu Val Phe
340 345 350

Ile Gly Gln Ala Ile Asp Pro Ser Arg Leu His Arg Glu Leu Asp Ala
355 360 365

Cys Leu Leu Thr Thr Ala Glu Ile Glu Leu Gly Pro Asp Val Trp Thr
370 375 380

Thr Trp Ser Asp Pro Leu Gly Val Gly Tyr Thr Asp Gln Thr Val
385 390 395